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DEVELOPMENT PROJECTS IN IRAQ, SYRIA LEBANON AND TRANSJORDAN

And

ESTIMATED COSTS OF IMPLEMENTING REFUGEE SETTLEMENT

Revision of
Divisional Reports No. 9 and No. 16

May 19, 1949

DEPARTMENT OF STATE

Division of Research for Near East and Africa

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DEVELOPMENT PROJECTS IN IRAQ, SYRIA, LEBANON AND TRANSJORDAN

Some of the plans developed by the Near Eastern countries for the better utilization of their land and water resources seem to be capable of implementation for the settlement of Palestine Arab refugees.

The basic impetus behind the development of land and water utilization programs has been the practical necessity of providing flood control and a higher standard of living for the peoples of the various countries.

The plans and programs which have been developed have for the most part been compiled by or with the assistance of foreign technical experts and may be presumed to be basically sound.

In considering the possible utilization of some of this basic planning in connection with refugee settlement there are various factors which require consideration:

1. While for most countries basic long-range programs have been studied and planned, the more immediate government programs for implementation comprise largely the immediate needs of the present local population. Settlement of refugees would seem to indicate the need for supplementing these immediate programs within the framework of the longer range programs rather than attempting the utilization of immediately necessary local programs for refugee settlement.

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2. While some of the basic long-range plans involve rather extensive capital works, there are others which can be accomplished with relatively limited capital construction. The latter would seem to be more adaptable for refugee settlement except where capital works for flood control and/or water storage are an integral part of overall development.

3. While there are some areas of so-called rainfed lands which might be available for settlement, it is necessary to give consideration to the fact that the fall of rain largely occurs in the winter months and is subject to wide fluctuation from year to year. Stability in most agricultural settlements seem to depend on some form of irrigation, at least to supplement the water supply. There are apparently considerable areas, largely in Syria, where pump-type irrigation could be programmed in connection with the settlement of refugees without the necessity for development of large-scale irrigation works.

4. For the sake of stability in the area it seems essential that plans for the settlement of the refugees must consider not only elements of cost and time, but also the socio-economic and political repercussions on local conditions.

Among the countries of the Near East, Iraq appears to present the largest potential for an expanded population. Syria appears to present the next largest potential. Lebanon

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and Transjordan have much smaller, though possibly important, potentials for refugee settlement.

Iraq: Further expansion and development of Iraqi plans for development of the Tigris and Euphrates could easily provide for the settlement of all of the refugees in so far as land and space are concerned. These development plans, however, involve extensive capital works for flood control, water storage, irrigation canals and drainage. They involve a type of agriculture not familiar to most of the refugees and would involve the settlement of refugees in a different socio-economic atmosphere, which could possibly lead to friction.

Syria and Lebanon: Further expansion and development of Syrian plans for the development of the Euphrates and of Syrian and Lebanese plans for utilization of the land and water potentials of other rivers, such as the Litani and the Orontes, the drainage of swamps, and other reclamation works would appear to offer a relatively good opportunity for the settlement of substantial numbers of refugees. The type of agriculture would be relatively familiar to most of the refugees, and many of them have a socio-economic affinity for these countries. An integrated Syrian-Lebanese economic development would also appear to offer more opportunity for the urban type refugees from such cities as Jaffa, Haifa

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and Acre, whose numbers are substantial and whose settlement presents special problems not common to the settlement of agricultural refugees.

Arab Palestine-Transjordan: Development of Transjordanian plans for the Yarmuk and Jordan waters and the better utilization of Jordan valley run-off waters together with the surveying and planning of developments for Arab Palestine seem to indicate the possibility for limited settlement of refugees, principally along the Jordan valley and in the Jericho area.

Egypt, Saudi Arabia and other Near Eastern countries have been assumed to be outside the area for refugee settlement.

Attachments

Planned Development of Land and Water Resources

Syria	- Summary - Description
Iraq	- Summary - Description
Lebanon	- Summary - Description
Transjordan	- Summary - Description

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SYRIA
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

Summary

Basic programs for the development of the land and water resources of Syria have been worked out; however, considerable investigation and survey work are still required. There is some opportunity for extended cultivation in the areas of rain-fed lands, but the major potentialities for agricultural expansion depend on irrigation developments, principally along the Euphrates in the Jezireh.

Syria presumably could absorb a substantial portion of the Palestine Arab refugees; such settlement should, however, take into account Syria's requirements for its own population as currently programmed. The available data are insufficient to determine precisely the financial and technical requirements for those schemes, but it is clear that substantial assistance would be needed. Major portions of a Euphrates irrigation project would, however, presumably be self-liquidating.

Irrigable lands fall into two groups: (a) those requiring relatively small capital outlays for pumps, canals, and similar minor works, and (b) those requiring capital expenditure for major costly works. It is suggested that lands in the first category would serve the more immediate settlement needs for Palestine Arab refugees.

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I. SYRIA
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

A. Economic Background:

Syria is an agricultural country with a settled population of 2,901,000, of which 71.5 percent or 2,076,000 are classified as rural. The non-sedentary population consists of about 150,000 nomads and about 150,000 semi-sedentary persons, bringing the population total to about 3,201,000.

The total area of Syria is about 57,900 square miles, of which about 15 percent or 5.5 million acres is presently under cultivation. About one-third of the cultivated area is normally allowed to lie fallow. Approximately 10 percent of 585,000 acres of the cultivated lands are irrigated.

Less than half of the area potentially cultivable is now under cultivation; however, large portions of such potential farm lands fail to receive the minimum rainfall essential to cultivation during a substantial number of the crop years. Primary settlement consideration must therefore be given to those areas which receive a sufficient rainfall or to those which are adaptable to irrigation.

Rainfall is generally limited to the winter months and the amount of fall is subject to considerable fluctuation. The present irrigated area can be almost tripled, from the present 585,000 acres to about 1,500,000 acres. The yield per acre can be raised considerably through improvement

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in methods, techniques, and the introduction of better animal breeds and plant varieties.

B. Surveys of Land and Water Resources and of Potential Developments:

In 1947 a United States-Syria Agricultural Mission investigated the status of agriculture in Syria and made a number of recommendations for improvements and developments.

In 1948 the British firm of Alexander Gibb and Company completed a detailed report on The Economic Development of Syria. Recommendations for further investigation of specific projects were also included in the report.

C. Scope of the Surveys:

The United States-Syria Agricultural Mission Report stressed the need for increased cultivation and extended irrigation of especially mentioning the lands along the Euphrates and in the Jezireh and the valley of the Orontes. The report also covered better plant varieties and animal breeds and the establishment of agricultural industries, and made specific recommendations concerning research, agricultural education, and administrative, regulatory and control programs.

The Gibb report covered the major natural resources of the country and contains a substantial chapter evaluating the role of irrigation and drainage in the agricultural potentialities of Syria.

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The Gibb report classifies the lands available for irrigation development, from south to north, as follows:

Yarmuk Basin	-	Mzerib Project
Orontes Basin	-	Ghab Depression
Euphrates Valley	-	Meskeneh to Ragga
Euphrates Valley	-	Deir el Zor to Abu Kemal
Euphrates Valley	-	Deir el Zor Mohafazah from a weir in the Halabiye Gorge.
Khabur Valley	-	
Other	-	Minor catchments in the Mohafazat of Latakia and the Caza of Tigris
Drainage	-	Mzerib, Awaj and Barada wastes in south Syria
	-	Roudj swamp and certain marsh lands.

D. Conclusions and Recommendations of the Survey (Gibb):

Syria possesses the water resources necessary to irrigate about 1900,000 additional acres of land. These resources need to be developed in order to raise the agricultural productivity of the country, not only to feed the rapidly increasing population, but also to supply the raw materials for industry and trade.

Although the undeveloped resources of the country are substantial they are not unlimited and may in the course of years prove insufficient to meet the needs of the country. Irrigation development, therefore, must fit into the economic development of the country as a whole and must not outstrip the ability of the agricultural population to make full use of the lands once they are available for irrigated cultivation.

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The Gibb report proposes a ten year expenditure of about 200 million dollars to cover irrigation and drainage projects, hydro-electric and thermal power installations, rural and urban water supply systems, roads, railways, airports, ports, telephones, and public buildings. Of this amount 30 million dollars is estimated as the cost of a ten year irrigation and drainage scheme.

The proposed irrigation and drainage scheme is divided into two five year projects as follows:

First five years:	
Orontes - Homs and Hama	- Completion of canal C - Collection of data for canals A and B
Khabur - Jezireh	- Completion of canal A - Completion of present scheme
Orontes - Ghab Valley	- Detailed investigations and execution of drainage works
Euphrates - Halabiye	- Detailed investigation of site for weir
Roudj	- Detailed investigation of drainage.
Second five years:	
Orontes - Homs and Jama	- Execution of Canals A and B
Euphrates - Halabiye	- Execution of derivation weir - First stages of irrigation system
Roudj	- Execution of Drainage scheme

Projects for later consideration are listed as additional canals on the Orontes in the Homs-Hama region and on the Khabur in the Jezireh area, and the extension of the irrigation system on the Euphrates in the Halabiye area.

The above recommendations, which include only the first stages of the irrigation system on the Euphrates, would permit the irrigation of some 150,000 acres and provide greatly improved agricultural conditions for some of the more overcrowded areas of Syria as well as some possibility of resettlement. Additional implementation of the Euphrates scheme between Meskene and Abu Kemal could provide as much as 750,000 acres of irrigated land, but at a cost over and above that programmed for the Syrian Government. A less ambitious scheme would make available about 250,000 acres of irrigated land through the installation of pumping facilities and would involve the minimum of expense in construction works.

E. Projects Capable of Utilization in Providing Work and for Settlement for Palestine Arab refugees:

The Mzerib project in Hauran and the Orontes and Roudj projects provide an outlet for a limited number of refugees. Implementation of the Euphrates project could provide for a substantial portion of the refugee population. One feature of the Euphrates project that is of possible interest is the suggestion in the Gibb report that costly irrigation works would be limited and that considerable areas can be irrigated by oil-powered pumps. A partial scheme for providing about 250,000 acres of irrigated land by pumping, can apparently be

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affected for a substantially moderate capital investment. It is also pointed out that considerable work needs to be done on the cadastral survey of the country and in determining ways and means of liquidating the grazing rights of the nomads now pasturing their flocks in this area.

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IRAQ
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

SUMMARY

Detailed plans for the development of the land and water resources of Iraq were developed in 1949. About 25 percent of the land area is listed as cultivable, although only about 5 percent of the land area is currently subject to cultivation. About 60 percent of the potentially cultivable land would fall within the classification of irrigated lands if development schemes were carried out to their fullest extent. There is no shortage of land for development or of water facilities for the extended irrigation. While the development of this area requires a heavy capital expenditure, the projects are largely self-liquidating. Financial and technical assistance designed to effect the implementation of Iraq's basic development projects would add to the security of the area from dangerous floods, as well as providing for improved standards of living and for the settlement of substantial numbers of Palestine Arab refugees. Such assistance should not overlook the need for coordinated technical assistance in the fields of public health, education, agricultural methods and communications and transport.

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I. IRAQ
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

A. Economic Background:

Iraq lies between the plateau of northern Arabia and the mountain edge of southwest Persia, and forms a lowland corridor between Syria and the Persian Gulf. Its three geographical divisions are the western and southern deserts, the Tigris-Euphrates lowland, and the Kurdish mountains. The prosperity of Iraq is directly tied to its agricultural productivity and its agricultural prosperity, historically, has only been possible in relation to the proper control and use of its water resources. Modern Iraq has begun the restoration of its ancient irrigation systems, which have been badly neglected over many hundreds of years.

Iraq, with a total area of 175,000 square miles and a population of 4.8 million, includes large areas of desert or otherwise uncultivable lands. About 25 million to 30 million acres, or 22 percent to 26 percent of the total area, is recorded as cultivable, some 10 million to 12 million acres being in the rainfall zone in which crops depend on the natural rain and about 15 million to 18 million acres being in the irrigation zone. Only 5 million to 6 million acres are normally cropped by the country's 2.7 million rural

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inhabitants, and implementation of the country's planned development of land and water resources would provide a viable agricultural economy for a greatly expanded population as well as an increased standard of living for all of the inhabitants.

B. Surveys of Water Resources and Their Potential Development:

In April 1945 the Iraqi Government asked the British Government to recruit a British Irrigation Development Commission to undertake a comprehensive study of irrigation conditions and water storage, opening of main and subsidiary canals, establishment of irrigation systems, and means of controlling floods, and to submit a detailed report on the policy they recommended for adoption by the Iraqi Government looking to the solution of these problems. In February 1946 Mr. F. F. Haigh, an engineer with long experience in India, arrived to head this commission. Mr. Haigh completed his survey early in 1949.

C. Scope of the Survey:

The survey undertook comprehensive investigations to determine measures for flood control on the river Tigris and its major tributaries the Diyala, the Adhaim, the Little Zab, and the Great Zab; for flood control on the Euphrates; and for irrigation and drainage systems to expand and improve

irrigation development. Flood conditions on both rivers have been such as to endanger towns and villages in the lower valley and many of the formerly cultivated areas are now water-logged or have become saline. The proposals of the Haigh Committee dealt with the construction of dams, the development of run-off resevoirs to dispose of dangerous flood waters and provide a source of water for irrigation, the construction and reclaiming of canals for irrigation, and extensive drainage schemes. In addition to laying out the broad basis for an integrated long-range development, the committee also made specific recommendations for a work program to be carried out over the next 10 years. While this immediate program is not nearly so extensive as the overall program, it is so engineered that future developments can be carried out in relation to those programmed during the first 10 years.

D. Conclusions and Recommendations of the Survey:

The later reports of the commission propose certain specific projects of flood control, irrigation development and drainage which should be carried out over the next 10 years in order to provide for Iraqi needs, as follows:

	For Flood Control	For Irrigation	Dollar Cost	Years Scheduled
Habbaniyah Lake	X	X	8,000,000	1949-51
Wadi Tharthar Depression	X		28,000,000	1949-53
Diyala River	X	X	10,000,000	1952-54
Hillah Canal System		X	10,000,000	1949-51
Gharraf Canal System		X	5,000,000	1954-58
Drainage		X	30,000,000	1949-58
Nahrwan Canal System		X	6,000,000	1954-58

1. Flood Control: The Habbaniyah Lake run-off is designed to cut the flood flow from 5,200 cubic meters per second to 2,500 cubic meters per second by construction of an inlet capacity of 3,000 cubic meters per second. The Wadi Tharthar depression run-off is designed to reduce Tigris floods from 12,000 cubic meters per second above Baghdad to 6,000 cubic meters per second by construction of an inlet into the depression. The Diyala dam is designed to control the Diyala flood output down to 1,000 cubic meters per second in order to provide additional flood control for the Tigris below Baghdad.

It is estimated that these flood control projects, which will cost in the neighborhood of $40,000,000 upon completion, are financially sound because they will make available new building sites in Baghdad valued at about $16,000,000 and because the present annual expenditure of $800,000 per year for flood control is estimated to represent a capital value of $24,000,000.

2. Irrigation Projects: Irrigation development projects scheduled for the next 10 years would permit the extension of irrigation to about 1,250,000 acres of land. This land is now classified as worthless, but its value after the application of irrigation is expected to exceed the cost of reclamation, which is estimated at about $35.00 per acre. It is expected that the full value of this reclamation will be recovered by the sale of government lands and by the application of a tax to private lands.

3. Drainage: The expenditure of $30,000,000 for drainage is expected to provide for the improvement of 1,750,000 acres of irrigated land at an approximate cost of about $15.00 per acre. The major portion of these lands are now in cultivation, but production has fallen off because the land has become waterlogged and saline. It is estimated that the drainage project will increase productivity by 25 percent and that the 3.5 percent Istihlak tax on the extra produce going to market, plus a fixed annual tax of 65 cents per acre, will yield sufficient income to meet maintenance charges and retire the capital expenditure in about 27 years.

Much more extensive development of irrigation is possible within the framework of the above overall schemes. The present plan, for instance, makes no provision for the use of water diverted into Wadi Tharthar as flood relief, since this water is not required for currently-planned irrigation works. As the demand for new lands increases due to

changing conditions, water from this natural storage site will be available for further extensive irrigation works. The total area which can be brought under cultivation can double or triple the country's population capacity.

E. Projects Capable of Utilization in Providing Work and/ or Settlement for Refugees:

While major portions of the works recommended for immediate development are designed to combat flood dangers and to improve deteriorating soil conditions on existing farm lands, the development of expanded irrigation projects could easily provide both immediate work and eventual settlement prospects for as large a number of refugees as was deemed practical. Iraq possesses perhaps the best long-range development prospects of any of the Near Eastern countries, and while development will require the provision of capital, the projects are largely self-liquidating over a reasonable period of years.

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LEBANON

PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

Summary

The Lebanese Ministry of Public Works has prepared a program calling for a substantial increase in the quantity of irrigated lands, the major aspects of which involve the utilization of the waters of the Litani River, the Nahr el Bared, and Lake Yammouneh. These schemes, if completely implemented, would almost double the quantity of irrigated lands and would also, through the inclusion of hydro-electric works, supplement the presently inadequate development of power.

The Lebanese economy is probably not capable of absorbing substantial numbers of agricultural refugees; however, an overall economic program for Syria and Lebanon would permit the absorption of refugees with commercial and other urban skills. Any expansion of the Lebanese economy through the absorption of such workers would make the need for an expanded agricultural economy through expanded irrigation even greater.

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I. LEBANON
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

A. Economic Background:

Lebanon comprises an area of about 4,000 square miles, of which about 21 percent or 525,000 acres is presently under cultivation. It has been estimated that an additional 745,000 acres are cultivable. The irrigated area comprises some 110,000 acres, of which about 65 percent is devoted to cereals, legumes, and vegetables, the remaining 35 percent being in orchards. Expansion of irrigation can add about 100,000 acres to the irrigated lands.

The total population of Lebanon is just over 1,200,000 and is predominantly rural, the urban population of Beirut accounting for 22 percent of the total population. Population density ranges from 100 per square mile in the Beqaa valley to about 400 per square mile in the Mount Lebanon area.

Average rainfall conditions are good, but the rains are seasonal and irrigation where possible is a major asset. Additional irrigation projects are in process or undergoing study looking to further implementation. The Litani River, Lake Yammouneh and the Nahr el Kebir appear to present substantial opportunities for the extension of irrigation.

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B. Surveys of Land and Water Resources and of Potential Development:

Various surveys have been undertaken to determine the potential development of Lebanon's land and water resources both by the Lebanese Government and by foreign agricultural experts. It is understood that Alexander Gibb and Company have prepared an economic analysis of Lebanon, but this report has not been available for study in connection with this paper. There has been apparently considerable conflict in Lebanon between those desiring expansion of irrigation and those desiring increased production of hydro-electric power, the latter being largely private interests. The Ministry of Public Works has prepared a program for increased irrigation works and the production of electric power and further studies are being undertaken.

In 1947 a United States Agricultural Mission to Lebanon made an extensive survey of the resources of Lebanon and made a number of basic recommendations.

C. Scope of the Surveys:

The Report of the United States-Lebanon Agricultural Mission strongly recommends that the Lebanese Government give priority to an overall plan for the development of its vital water resources for irrigation and power and domestic use.

In this connection it is understood that the Lebanese Government's plans include the following irrigation projects:

1. Irrigation of the Akkar plain by the Nahr el Bared - potential 25,000 acres
2. Irrigation of the Batroun plain by the Nahr el Batroun - potential 750 acres
3. Irrigation of the Tyre-Sidon plain by the Kasmieh River - potential 10,000 acres
4. Irrigation of the Baalbek plain from Lake Yammouneh - potential 25,000 acres
5. Irrigation of the Bekaa plain by the Litani River - potential 25,000 acres
6. Irrigation of the Kaa region by the Nahr Lahoue - potential 1,750 acres.

D. Conclusions:

The Lebanese Ministry of Public Works believes that Lebanon's rivers should be used for both irrigation and for hydro-electric power production.

The primary phase of the government's hydro-electric scheme envisages a total output of 50,000 kilowatts, while the secondary phase would add 100,000 kilowatts of additional output. The irrigation project, partly tied in with hydro-electric development and partly independent development, would add about 87,500 acres to the area under irrigation.

E. Projects Capable of Utilization in Providing Work and/or Settlement for Palestine Arab Refugees:

The Lebanese economy is probably not capable of absorbing substantial numbers of agricultural refugees, however, an overall economic program for Syria and Lebanon would permit the absorption of refugees with commercial and other urban skills. Any expansion of the Lebanese economy through the absorption of such workers would make the need for an expanded agricultural economy through expanded irrigation even greater.

TRANSJORDAN
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

Summary

Detailed plans for the development of the land and water resources of Transjordan were developed in 1939. Only 5 percent or 1,123,200 acres, of the country is presently cultivated, of which some 64,640 acres consist of irrigated lands, the remainder being under rain-fed or dry-farming cultivation. The only major area for expansion lies on the Transjordan side of the Jordan depression, which presents an opportunity for irrigation expansion ranging from 15,000 to 75,000 acres, depending partly on the amount of capital available and partly on the extent of water availability from the Jordan and the Yarmuk rivers. There is a real shortage of cultivable land in Transjordan, and planned developments will be largely required to meet the existing needs of the local population if there is to be security and stability in the country. Financial and technical assistance in developing the planned program, together with technical assistance in developing a fisheries industry on the Gulf of Aqaba, an expanded industrial economy based on local production of raw materials, and improved

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road transport facilities to permit the movement of goods and open a potentially good tourist traffic would probably permit the absorption of 25,000 to 50,000 refugees.

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I. TRANSJORDAN
PLANNED DEVELOPMENT OF LAND AND WATER RESOURCES

A. Economic Background:

Transjordan is largely a desert area country of about 33,750 square miles. Only about 10 percent of the country, some 3,540 square miles, enjoys a rainfall of 8 or more inches annually.

About 1,755 square miles, or 5 percent of the land, are cultivated. Some 101 square miles are under irrigation and devoted to the production of irrigated crops; 31 square miles are in vineyards; and the remaining 1,623 square miles are devoted to the growing of cereals, mostly under dry-farming conditions.

The remaining 1,785 square miles within the area of minimum rainfall conditions may be classified as follows: About 1,100 square miles consist of forest areas or areas of rocky, soil-denuded, largely uncultivable slopes; some 170 square miles consist of grazing lands; and the remainder represents lands bordering on the desert and which will yield a crop only in years of exceptionally ample and well-distributed rainfall.

With a population of 400,000 persons, 267,000 of whom are classified as rural, Transjordan thus has a population density of 228 persons per cultivated square mile,

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or, discounting the urban and nomad populations, an agricultural population density of about 152 persons to the cultivated square mile.

B. Surveys of Water Resources and their Potential Development:

The Palestine Royal Commission in 1937 reported that Transjordan had not been fully surveyed and that there was not sufficient evidence available on which to form an estimate of the amount of uncultivated land which might be rendered cultivable. The Commission, therefore, recommended that a survey of Transjordan should be made and a scheme prepared for its irrigation and development. Field work on a hydrographic survey of Transjordan was begun in late 1937, and resulted in 1939 in a Report on the Water Resources of Transjordan and their Development prepared by M.G. Ionides, Director of Development, Transjordan.

C. Scope of the Survey:

The survey concluded that there was additional land in Transjordan which could be cultivated and that the availability or non-availability of water represented the limiting factor. The possibilities of water conservation were considered from two aspects:

1. Those depending upon soil management for the conservation of water which otherwise runs to waste or evaporates.

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2. Those in which irrigation and storage of water in resevoirs is an essential part of the system.

Under soil management the following were considered:

1. Improved dry-farming methods,

2. Expansion of dry-farmed zones toward areas of smaller rainfall,

3. Clearing and terracing of lands at present uncultivable, and

4. Afforestation.

Under irrigation and storage the following were considered:

1. Storage in direct run-off resevoirs,

2. Flood irrigation from direct run-off,

3. Extension of government control over distribution of water from existing irrigation systems,

4. New free-flow irrigation systems,

5. Construction work aimed at cutting water losses,

6. Pumping from rivers, and

7. Pumping from wells.

The survey determined that some improvements were possible under each of the above headings, but that rapid improvements were possible only through the expenditure of capital. Inasmuch as Transjordan was a country with limited capital resources, it was recommended that the

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country seek first to develop those resources offering the largest return for limited capital investment.

D. Conclusions and Recommendations of the Survey:

Actual land hunger exists in Transjordan, and even if the present cultivated area is increased by clearing and terracing and by improved farming methods, and if the total rainfall on this expanded area can be made 100 percent available, the increased cultivable area will suffice for only 280,000 persons directly living on the land, or little more than the present rural population.

The climate of the country is of two kinds, that of the Ghor (Jordan) and that of the Plateau. The larger areas of potentially irrigable land occur in the Ghor, and the climate is better suited to the production of the more valuable crops; also, this area is closer to the more promising markets for valuable crops.

Transjordan has strictly limited resources and the development of water conservation works must be strictly programmed.

The only works on which capital can be spent with any prospect of a return are those designed to control the existing irrigation systems in the Ghor in order to prevent disputes over water rights and provide more efficient utilization of available water and the construction of a River Yarmuk

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diversion canal to increase the amount of irrigable land in the Ghor. Saving of absorption losses by the construction of impervious canals, pumping of Jordan water to the lower lying (Zor) lands, and pumping from wells are also considered practical. In the Jordan Valley there is little dry-farmed land and agriculture depends on irrigation. This area presents the only opportunity for rapid and economic development.

Construction of a River Yarmuk diversion canal, improved control and utilization of the rivers and wadis draining the Transjordan plateau, pumping of Jordan water and pumping from wells would permit the intensive cultivation of the major portion of western Transjordan from the Yarmuk in the north to the lower end of the Dead Sea in the south and double or better than double the amount of irrigable land.

As a matter of practical concern the utilization of the Yarmuk water is complicated by existing contract provisions by which the Palestine Electric Company Concession utilizes part of the water of the Yarmuk, and respective claims to water would have to be determined.

E. Projects Capable of Utilization in Providing Work and for Settlement for Refugees:

Implementation of Transjordan's development program by the advancement of financial and technical assistance

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will permit a substantial increase in the amount of irrigated lands in the Ghor and Zor areas of the Jordan Valley. These projects, which involve the building of canals, construction of head sluices and regulating works, clearing of scrub, willow and reed growth from Zor lands plus other related work, would provide employment for a number of the Arab refugees. In view of Transjordan's immediate need for further development of its agricultural lands to meet the requirements of its normal population, however, only a portion of the new works could be made available for refugee settlement, an integrated program being required. Inasmuch as a considerable portion of the cost of the development program promises to be self-liquidating, it would be reasonable to assume that the Transjordan Government should undertake repayment of capital expenditure involved in the non-refugee portions of the overall project.

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PALESTINE REFUGEE PROBLEM

Estimated Costs of Implementing Refugee Settlement

The various irrigation and land development schemes of Iraq, Syria, Lebanon and Transjordan have been studied in an effort to estimate their adaptability for refugee settlement and to determine the probable cost of such settlement on a per capita refugee basis. The projects which have been considered in this appraisal include the Jazirah project in Syria, comprising 250,000 out of a possible 750,000 acres; the Ghab and other scattered projects in Syria, comprising 150,000 acres; and Transjordan and Arab Palestine, comprising about 116,000 acres. These represent the projects on which the greatest number of refugees can be resettled most economically. Further possible areas of settlement at a probably increased cost per capita include an additional 500,000 acres in Syria through more intensive use of the Euphrates water and some millions of acres in Iraq through more intensive use of the waters of the Tigris and Euphrates.

As details of costs of the projects themselves are not available at this time, it is assumed for the purposes of this statement that the costs per unit of land developed for settlement will not vary greatly from country to country and that a general average estimate is sufficient. It has been assumed that the average land requirement per family unit of six persons will approximate eight irrigated acres per family unit, which would permit the resettlement of some 387,000 persons. On this basis, it is believed that the following figures represent the approximate cost:

	Cost Per Family Unit of Six Persons
1. Cost of undeveloped land, eight acres at $25 per acre	$200
2. Cost of major works	
(a) Cost of applying irrigation to land at $50 per acre	$400
(b) Cost of adobe-type dwelling unit (2½ room)	$600

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	Cost Per Family Unit of Six Persons
3. Cost of settling refugees on land	
(a) Cost of farm tools	$100
(b) Cost of essential household equipment and utensils	$ 30
(c) Cost of farm animals (for traction, Transport, and food production -- milk, eggs)	$325
4. Cost of associated facilities (schools, roads, drinking water systems, sanitation, communication, and basic local transport) at an average of $40 per capita	$240
Total estimated cost of resettlement per family unit of six	$1895

Estimated cost per capita for resettlement is about $316.

To this cost there would have to be added allowance for administration, an allowance for the cost of transporting refugees and their possessions to their new homes and other probable costs in connection with the expansion of government services in the new areas and possibly some improvement of the government's financial and administrative structure.

Resettlement projects of this magnitude will require a considerable additional educational and readjustment program if their benefits are to be fully realized. It is believed that a realistic application of the Point Four Program for Technical Assistance can meet such needs along the following lines: training of the fellah in the best utilization of the new land both as to methods of production and cultivation of new crops; improved methods of animal breeding; improved pest control and fertilization; and better methods of processing and handling of the agricultural produce.

Assuming that one third of the cost of applying irrigation to the land, that 5 percent of the cost of dwelling units; that 40 percent of the cost of farm tools, that 50 percent of the cost of farm animals and that about 30 percent of the cost of associated facilities will require importation of materials and services, it is estimated that about $105 of the $316 per capita cost will represent a charge against imports from abroad.

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APPENDIX A

POSSIBILITIES FOR REFUGEE RESETTLEMENT IN THE HOMS HAMA REGION

Gibb (page 5) is of the opinion that there are 6500 KM^2 (1,606,150 acres) of cultivable land in the governorate of Homs and 4750 KM^2 (1,173,725 acres) of cultivable land in the governorate of Hama. Of this, he states that in the Homs governorate only 106,000 hectares (261,926 acres) and in the Hama governorate only 137,000 hectares (338, 527 acres) are under cultivation. Thus there would remain an unexploited cultivable area of 1,344,224 acres in the Homs governorate and 835,198 acres in the Hama governorate, or a total of 2,179,422 acres.

It is estimated that only one tenth of this area is cultivable by irrigation, which would leave 217,942 acres exploitable by irrigation. At the rate of 8 acres per family of six, this would take care of 27,242 families or 163,452 persons.

The main problem in the exploitation of this land is the question of the existence of a supply of water adequate to irrigate this acreage. In this case, the source of water on which we should have to depend is the Orontes and the Lake of Homs.

It appears that at present, the minimum annual average flow of the Orontes into Lake Homs is 50,459,600 m^3, to which must be added the input of a number of seasonal streams and underwater springs on which no flow data are available. It is to be noted, however, that there is a difference of 150,000,000 m^3 between the maximum level of the lake at 500 meters and the minimum level of 497.30 meters. The annual minimum flow from the lake, required to operate existing irrigation systems and provide sufficient water in the lower Orontes, is 48,250,080 m^3 per year, leaving a balance of something over 100,000,000 m^3 for further utilization if the dam were sufficiently heightened (about two meters) to store this. This would suffice for the irrigation of about 25,000 acres, or enough for about 20,000 refugees if the water were 100 percent utilized, which is improbable. If each family were given an additional 20 acres of rain-fed land, the number of persons settled on irrigated land could be approximately doubled, with only 4 acres instead of 8 to a family.

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This summary is sufficient to show that on the basis of available figures, the area of land supposed to be cultivable by irrigation is actually only about one-tenth of that estimated by Gibb owing to the limited water supply. This necessarily greatly limits the number of refugees who could be resettled in this area, since in order to eliminate the dangers of hardship and famine likely to result from total dependence on dry farming in an area of widely fluctuating rainfall, we have deemed it advisable to use rain-fed land only to supplement the minimum subsistence provided by irrigated plots.

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